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Management of work-relevant upper limb disorders: a review

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ABSTRACT

Background Upper limb disorders are clinically challenging and responsible for considerable work loss. There is a need to determine effective approaches for their management.

Aims To determine evidence-based management strategies for work-relevant upper limb disorders, and explore whether a biopsychosocial approach is appropriate.

Methods Literature review using a best evidence synthesis. Data from articles identified through systematic searching of electronic databases and citation tracking were extracted into evidence tables. The information was synthesised into high level evidence statements, which were ordered into themes covering classification/diagnosis, epidemiology, associations/risks, and management/treatment, focusing on return to work or work retention, and taking account of distinctions between non-specific complaints and specific diagnoses.

Results Neither biomedical treatment nor ergonomic workplace interventions alone offer an optimal solution; rather, multimodal interventions show considerable promise, particularly for occupational outcomes. Early return to work, or work retention, is an important goal for most cases and may be facilitated, where necessary, by transitional work arrangements. The emergent evidence indicates that successful management strategies require all the players to be onside and acting in a coordinated fashion; this requires engaging employers and workers to participate.

Conclusions The biopsychosocial model applies: biological considerations should not be ignored, but psychosocial factors are more influential for occupational outcomes. Implementation of interventions that address the full range of psychosocial issues will require a cultural shift in the way the relationship between upper limb complaints and

work is conceived and handled. Dissemination of evidence-based messages can contribute to the needed cultural shift.

Key words:

Biopsychosocial, interventions, return to work, upper limb disorders, work-relevant

INTRODUCTION

This paper reports on a literature review commissioned by the UK Health & Safety Executive. The present article is an abridged version of the original report entitled 'Management of upper limb disorders and the biopsychosocial model' (1).

Acknowledging that musculoskeletal disorders are responsible for a considerable proportion of work loss and that not all upper limb disorders manifesting at work can be prevented (2), there is a need to determine effective approaches for managing those cases that do occur.

Upper limb disorders (ULD) are characterised by symptoms (usually pain) which have inconsistent associations with work loss and disability. Whilst there is evidence that musculoskeletal disorders in general, like other common health problems, have a strong association with psychosocial factors (3), it is uncertain to what extent that holds true specifically for ULDs.

This review aimed to establish the extent to which the scientific evidence supports management of ULDs according to the biopsychosocial model. In particular, the objective was to draw conclusions on the question of whether there is evidence that the biopsychosocial model can be successfully applied to the management of ULDs, and to provide evidence-based, high level messages about what should be done to help people with ULDs recover quickly and achieve sustained return to work.

METHODS

The overall methodology should be viewed as a 'best evidence synthesis', summarising the available literature and drawing conclusions about the balance of evidence, based on its quality, quantity and consistency (4). This approach offers the flexibility needed to handle complex topics, but at the same time takes a rigorous approach when it came to assessing the strength of the scientific evidence. A more detailed description is in the original report (1).

An electronic search of the major electronic databases was conducted in June 2007, limited to articles published from 1996 onwards. It included search strings with all relevant keywords that might include the wide range of terms used to describe upper limb conditions in working-age adults. The main search was supplemented with citation tracking and hand searching to identify non-indexed material and relevant grey literature (grey literature includes [conference proceedings](#), [dissertations](#), [theses](#), [clinical trials registries](#) and other reports). To maintain focus on occupationally relevant disorders, some conditions and topics, such as rheumatic and systemic diseases, fractures, and disorders of peripheral circulation were excluded.

Systematic reviews and extensive narrative reviews were the primary focus, but individual studies were selected where they added additional or more detailed information. Once a potential pool of articles and studies was identified, the titles and abstracts were circulated among three reviewers (KB; NK; BP), who decided by consensus which full articles to select for possible inclusion in the review. Copies of some 200 relevant articles were obtained, circulated, analysed, and archived.

Summary data from included articles were entered into detailed evidence tables, which accompany the original report (1). Themes in the data were identified, and organised to cover three main categories: epidemiology/risk factors; intervention/classification;

concepts/guidance. The information was synthesised into high level evidence statements, each linked to the supporting evidence, with the final wording of the evidence statements developed through an iterative process involving all five reviewers. Finally the information contained within the evidence statements was distilled into a number of key messages related to evidence-based management of work-relevant ULDs.

The strength of the scientific evidence supporting the statements was graded using the system in Table 1. The strength of the evidence should be distinguished from the size of the effect: there may be strong evidence about a particular association, yet the effect size may be small.

Table 1. Evidence grading system used to rate the strength of the scientific evidence underlying the evidence statements (adapted from (5))

<i>Evidence grade</i>		<i>Definition</i>
***	Strong	generally consistent findings provided by (systematic review(s) of) multiple scientific studies.
**	Moderate	generally consistent findings provided by (review(s) of) fewer and/or lower quality scientific studies.
*	Weak	based on a single scientific study, general consensus and guidance, or inconsistent findings provided by (review(s) of) multiple scientific studies.

RESULTS

The findings of the review are presented in the form of high level 'evidence-statements' as a convenient way of summarising knowledge across complex themes, with each statement being linked to the main supportive sources of evidence.

The first set of statements concern the extent to which upper limb disorders can be classified and recognised; exploration of detailed diagnostic criteria was beyond the scope of the review.

Classification and diagnosis

*** Classification and diagnosis of ULDs is particularly problematic; there is a lack of agreement on diagnostic criteria, even for the more common specific diagnoses (eg tenosynovitis, epicondylitis, rotator cuff syndrome). Inconsistent application, both in the clinic and workplace, leads to misdiagnosis, incorrect labelling, and difficulties in interpretation of research findings. (6-12)

** The scientific basis for descriptive classification terms implying a uniform aetiology, such as RSI (repetitive strain injuries) and CTD (cumulative trauma disorders), is weak or absent and they are inconsistently applied/understood; there is an argument that such terms should be avoided. (13-18;18;19)

Nosological inconsistencies have led to debate and uncertainty over issues from pathology to causation (12). It is likely that misdiagnoses will be common both in the clinic and in the workplace (8), frequently manifested as patients receiving multiple and conflicting explanations and diagnostic labels from the various clinicians they encounter.

Whilst it is possible to achieve expert consensus on criteria for case definitions suitable for occupational surveillance systems, the clinical validity of the classifications is uncertain (20;21), and it is unknown if they lead to improved clinical management.

A considerable number of the articles retrieved for the present review take a 'lumping' approach whereby studies will include a variety of different disorders under labels such as 'work-related upper limb disorder' or simply 'musculoskeletal disorders'. However,

that is not a universal view, and some researchers point to the possibility of specific neuropathic pathologies underlying what is often termed non-specific arm pain, 'CTD' or 'RSI' (22). An alternative utilitarian approach is that the optimal definition for a disorder may vary according to the circumstances in which it is applied (23).

The epidemiology of ULDs is essential to understanding how they arise, in whom, and to inform on their natural history. There is a cascade in the way they are experienced and expressed, which is similar to that noted for other musculoskeletal problems such as back pain: a clear distinction should be made between the presence of symptoms, the reporting of symptoms, attributing symptoms to work, seeking health care, loss of time from work and long term damage, which may all have rather different determinants (24).

Epidemiology

*** There is a very high background prevalence of upper limb pain and neck symptoms in the general population: the 1-week prevalence in general population can be as high as 50%. Estimates of the prevalence rates of specific diagnoses are less precise, but are considerably lower than for non-specific complaints. Rates vary depending on region, population, country, case definition, and on the question asked. (6;25-33)

** Upper limb pain is often recurrent and frequently experienced in more than one region at the same time (both bilaterally and at anatomically adjacent sites). (19;29-31)

*** ULDs often lead to difficulty with normal activities and to sickness absence, yet most workers with ULDs can and do remain at work. (29;31;34;35)

The issue of risk factors for ULDs is clearly highly relevant to the concept of preventing onset of symptoms or injury, but the subject is poorly understood and inconsistently documented. Many factors, both occupational and personal, are purported to be 'risk factors', but the nature of those risks and their potential outcome(s) are readily misunderstood. This is evident in the high levels of growth in disability and work loss associated with musculoskeletal pain over the very period when industrialised countries have implemented occupational safety and health legislation, and developed

inspectorates for compliance and enforcement (36;37). Thus, further consideration of the evidence on 'risk factors' is needed to permit robust conclusions.

Associations and risks

- ** Large-scale influential reviews published around the turn of the millennium (which included much cross-sectional data) concluded that there were strong associations between biomechanical occupational stressors (e.g. repetition, force) and ULDs: backed by plausible mechanisms from the biomechanics literature, the association was generally considered to be causative, particularly for prolonged or multiple exposures (though a dose-response relationship generally was not evident). (38-40)
- *** More recent epidemiological studies involving longitudinal designs also suggest an association between physical exposures and development of ULDs, but they report the effect size to be rather modest and largely confined to intense exposures. The predominant outcome investigated (primary causation, symptom expression, or symptom modification) is inconsistent across studies and remains a subject of debate. This is true for regional complaints and (with few exceptions, e.g. (41)) most of the specific diagnoses. (26;28;36;41-47)
- * The evidence that cumulative exposure to typical (modern) work is the cause of most reported upper limb injury is limited and inconsistent. (19;38;48;49)
- *** Workplace psychosocial factors (beliefs, perceptions, and work organisation) have consistently been found to be associated with various aspects of ULDs, including symptom expression, care seeking, sickness absence, and disability. (19;26;38;40;50-56)
- *** Individual psychological factors (such as anxiety, distress, and depression) have consistently been found to be associated with various aspects of ULDs, including symptom expression, care seeking, sickness absence, and disability. (40;48;57-60)

There is no doubt that certain jobs can legitimately be considered to entail hazards that are, on the balance of probabilities, risk factors for the development of certain specific diseases (41), yet these diseases account for a relatively small proportion of all ULDs. Many non-specific upper limb symptoms are likely to result from some physical stress across joints and in soft tissues, but work is not the exclusive (or necessarily most important) source of such stress. There is emerging evidence that a combination of exposure to physical and psychosocial factors at work has a stronger association than

either type of factor alone (56;61). By and large, the duration of exposure has been inconsistently reported across the epidemiological literature, so attributing upper limb complaints to cumulative exposure is by no means fully justified. Of interest in this respect is that one of the strongest predictors of incident upper limb symptoms among workers can be a prior history of symptoms, as opposed to work exposures such as repetitiveness, work pace, or forceful awkward postures (62).

In view of the widespread experience of upper limb symptoms in the community, the patchy nature of associations between work characteristics and ULDs (both non-specific and specific), and the difficulty of establishing cogent occupational causation (63), the often used collective term 'work-related' seems not altogether accurate and potentially misleading. Instead, it seems more reasonable to refer to ULDs among workers as **work-relevant**, which avoids undue occupational attribution and the notion of permanent impairment yet acknowledges that work can be troublesome for people experiencing upper limb symptoms, irrespective of cause.

The retrieved articles on management and treatment covered a wide range of outcomes, clinical presentations, and interventions. The effectiveness of biomedical treatments was outside the scope of the review, but a simple 'review of reviews' indicates that many common treatments for ULDs are less effective than might be expected. Whilst some are effective for specific diagnoses (exercise for rotator cuff tendonitis; oral steroids for shoulder pain such as impingement syndrome or capsulitis; and, corticosteroid injections for tenosynovitis), effect sizes tend to be small, and are limited to clinical outcomes (1).

The retrieved material on management approaches for ULDs tended to reflect a view that there is a commonality to musculoskeletal disorders (MSD) that justifies considering their management in a generic sense.

Interventions for musculoskeletal disorders in general

- * General management principles are to provide advice that promotes self-management, such as staying active and engaging in productive activity (with appropriate modifications). Pain modulation and control should be directed toward allowing appropriate levels of activity. (64;65)
- *** Programmes using cognitive-behavioural approaches are effective and cost-effective at reducing pain and increasing productive activity in both the earlier and later phases. (66-68)
- * Multimodal integrated interventions that address both biomechanical and psychosocial aspects at the same time should be useful for managing musculoskeletal problems in the workplace. (3;40;69-71)

In addition to the information concerning MSDs in general, the search retrieved studies concerning interventions specifically on people with ULDs; specific diagnoses were generally included along with non-specific complaints.

Interventions specifically in respect of upper limb disorders

- ** Pain management programmes, using cognitive-behavioural principles, and multidisciplinary occupational rehabilitation for people with ULDs can improve occupational outcomes in the short term, and significantly reduce sickness absence in the longer term. Earlier intervention appears to yield better results. (72;73)
- * There is a conceptual case that rehabilitation should be started early, and that long periods of rest or sick leave are generally counterproductive. (14;74-77)
- ** Ergonomic work (re)design, directed at equipment or organisation, has not been shown to have a significant effect on incidence and prevalence rates of ULDs. Ergonomics interventions can improve worker comfort (which is valuable), which can in principle contribute positively to multimodal interventions. (13;15;48;78-81)
- * There is limited evidence that ergonomic adjustments (mouse/keyboard design) can reduce upper limb pain in display screen workers, but insufficient evidence for equipment interventions among manufacturing workers. (79;82;83)
- * In general, resting injured upper limbs delays recovery; early activity improves pain and stiffness, and can speed return to work yet does not increase complications or residual symptoms, and may lead to less treatment consumption. (84-88)

Return to work (RTW)

- * There is wide consensus that early RTW is an important goal, which should be facilitated by multimodal interventions, including provision of accurate information, pain relief, and encouragement of activity. An integrative approach by all the players (notably employer, worker, and health professional) is conceptually a fundamental requirement. (14;34;65;67;74;77;86;88-90)
- ** Although the components of RTW interventions vary, there is emerging evidence that integrative approaches can be effective for MSDs in general and, probably also for ULDs. Case management shows promise for getting all the players onside. Facilitation of RTW through temporary transitional work arrangements (modified work) seems to be an important component. (65;69-71;90-95)

Non-specific complaints and specific diagnoses

- * There is insufficient robust evidence to identify reliable prognostic indicators that are applicable across the ULD spectrum (specific diagnoses and regional complaints). (8;14;27;38;96)
- * There is inconsistent and conflicting evidence on whether and to what extent certain specific diagnoses and regional complaints should be conceived differently in terms of overall management targeted at vocational outcomes. (48;86;97;98)

The bulk of the literature reporting on the management of ULDs has either concentrated on regional symptoms (termed disorders by some investigators) or has taken an even wider perspective and combined regional symptoms (including the upper limb) under generic labels such as work-related musculoskeletal disorder. Whilst there seems to be good reason to separate (some) specific diagnoses when making clinical decisions about treatment, there is little evidence that the distinction is helpful when considering vocational outcomes and rehabilitation. It can be argued that returning a hurting worker to their job relies on achieving an acceptable balance between 'capacity' and 'tolerance', and this concept is largely independent of whether the individual has a specific diagnosis or regional complaint (86;97).

Overall, the evidence indicates that effective interventions for work-relevant ULDs require a multimodal approach: specific treatment (when needed, using a stepped approach) coupled with workplace accommodation (when needed, on a temporary basis). Whilst lumping and splitting approaches may be helpful under differing

circumstances (23), achieving a balance in terminology is likely to be particularly important: if wrongly applied, diagnostic labels can alarm and harm, whereas unemotive complaint-based labels can help 'normalize' the experience and ease the path to participation in productive activity.

DISCUSSION

This review used a best evidence synthesis to summarise the balance of the wide range of retrieved evidence (4), which has been synthesised in high level terms to provide a set of messages to guide the management of work-relevant ULDs.

The epidemiological evidence is quite clear: musculoskeletal symptoms affecting the upper limb and neck are a common experience among the general population, tending to be a recurrent complaint. A specific pathology cannot reliably be established for the majority of people with upper limb symptoms, indicating they might best be viewed as having a regional complaint. There is considerable debate over the classification of the various specific diagnoses and, whilst some consensus seems possible, diagnostic criteria remain unreliable – many cases will be mislabelled (whether colloquially or by a healthcare professional).

For many people, their symptoms will be work-relevant: their work may be painful or difficult irrespective of the origin of the symptoms. However, even when work is related to the expression of symptoms, that does not mean work was necessarily the underlying cause: it is apparent that work is not the predominant cause of most ULD episodes.

Many people with ULDs cope without recourse to healthcare or need for sick leave, yet a small number of people with ULDs will progress to persistent pain and/or long-term disability, irrespective of severity or diagnosis. This pattern is typical of a wide range of common health problems, in which personal and cultural factors are a predominant feature, notably the psychological and social variables that influence beliefs and behaviours (3). Although the evidence is limited for ULDs, knowledge from the literature on other musculoskeletal problems strongly implicates psychosocial factors as drivers for symptom reporting, workloss, and disability (99;100). Since there is no

particular reason to expect that complaints and disorders related to the musculoskeletal apparatus of the upper limb and neck is fundamentally different from the musculoskeletal apparatus of the lower back, it is logical and reasonable to surmise that there will be shared influences, and what evidence there is supports psychosocial factors as being important in understanding and managing ULDs.

Biomedical management of ULDs is seemingly less effective than might be expected, perhaps reflecting the difficulties around classification and diagnosis, together with uncertainties over the optimal timing of treatment delivery (longer duration of symptoms having a negative impact on outcomes (57)). Nevertheless, in principle, there is likely to be benefit from biomedical interventions aimed at controlling symptoms (and/or targeting any identifiable pathology) whilst offering support and encouragement for early return to normal activities (including work). However, in order to impact on work outcomes, intervention requires more than biomedical treatment. There is a need to address the range of psychosocial factors (obstacles to recovery/return to work) at both the individual and workplace level, and those efforts need to be coordinated and integrated among the relevant players, including the individual worker.

Some patients will have a recognised pathology requiring medical or surgical intervention (which may involve short-term rest), and there is some concern that applying the principles of an active approach together with early return to work will be inappropriate for some conditions such as 'tenosynovitis', where anecdotally rest is the preferred option (34). Although limited, the evidence on work-relevant ULDs (both specific and regional) is consistent with the principle of the active approach promoted and implemented for MSDs in general (85): importantly, there is no robust contradictory evidence. The notion of 'rest' as a sole treatment is likely to be unhelpful: even if specific aggravating activities need to be modified or avoided short-term, that does not preclude other activities and exercises being undertaken as part of therapy (101). So far as post-surgical management is concerned, there has been an increasing

recognition of the benefits of early activation following most surgical procedures, and restrictions may be more a matter of the surgeon's idiosyncratic advice than any absolute need (102).

Although early work-return is seen as advantageous, simply sending someone directly back to a job they find painful is counter-intuitive and inappropriate. There is a strong case for using transitional work arrangements as the facilitator, which takes account of both biological and psychosocial obstacles to RTW. There is considerable evidence for the use of temporary modification of activities to support people with regional pain states on their return to normal activity, and there is no clear evidence that the principle cannot or should not be applied to the specific diagnoses.

Just because the epidemiological pattern of most ULDs does not favour ergonomic interventions as a significant primary preventive measure, this does not mean there is no merit in making work ergonomically acceptable; jobs, naturally, should be within the reasonable capabilities of the workers. Unfortunately, portions of the ergonomics literature and official guidance give the erroneous impression that work is intrinsically the major cause of ULDs, and that by applying an 'ergonomics approach' they will be eliminated. The evidence reviewed here indicates they will not. Furthermore, a possible problem with ergonomic interventions is that they can reinforce workers' beliefs that they are exposed to a significant hazard, and thereby encourage undue reporting of symptoms, inappropriate work loss, and development of disability (36). Nevertheless, an ergonomics approach, correctly applied, should improve comfort and efficiency, thus assisting in accommodating those with work-relevant complaints or disorders.

Viewed overall, the evidence on the management of ULDs favours neither biomedical nor workplace interventions alone, either for regional complaints or specific diagnoses. Rather, what is needed is a biopsychosocial approach, which necessitates multimodal interventions with all the players onside and acting in unison. Whilst the evidence-base

supporting the principle of addressing the beliefs and behaviours of all the relevant players is as yet limited, the concept is central to overcoming biopsychosocial obstacles (3). Achieving all that will require a cultural shift in the way the relationship between upper limb complaints and work is conceived and handled. Educational strategies are likely to be a useful tool in that respect, but will need to be carefully developed and tailored to the relevant target audience (103).

If the need for cultural change is accepted then there is also a need for policy makers to rethink the priorities of certain underlying concepts (eg primary prevention v management: work-caused v work-relevant) and develop means to disseminate evidence-based information to the various players (employers, workers, healthcare providers, unions and trade/professional organisations, lawyers, legislators and decision-makers). Media campaigns are increasingly seen as a suitable vehicle to contribute to public health and cultural change in respect of health behaviours, supplemented by guidance material and patient education; this strategy has been recommended specifically in respect of ULDs (34).

Whilst the overall message may be clear – biopsychosocial factors are influential in the phenomenon of upper limb complaints and need to be addressed – there are gaps in the evidence. Observational studies will help to better understand the natural history of non-specific complaints and the specific diagnoses, and controlled trials are needed to determine the most appropriate means for implementing both clinical and workplace care. Innovative multimodal interventions seem promising, yet the optimal content, timing and method of delivery needs further clarification.

A number of salient messages emerge from the evidence, which may contribute to the needed cultural shift. They apply to the whole range of players involved (population/workers; employers; health professionals; unions; lawyers; media; policy makers; enforcers), so they will need to be carefully constructed for each target group,

tailored to their needs, and comprehensively disseminated. The main messages are reflected here in the key points box, and are available in expanded form in the original report (1).

Key points

- ULDs can be triggered by everyday activities and over-attribution to work can be detrimental to recovery: over-medicalisation and negative diagnostic labels are unhelpful.
- Many cases settle with self-management – this should be encouraged - though some need treatment: intervention should take a stepped care approach, based on a biopsychosocial principles.
- Early return to work is important, though some work may be difficult or impossible to perform for a short while: work should be comfortable and accommodating.

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Conflicts of interest

The authors have no conflicts of interest.

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